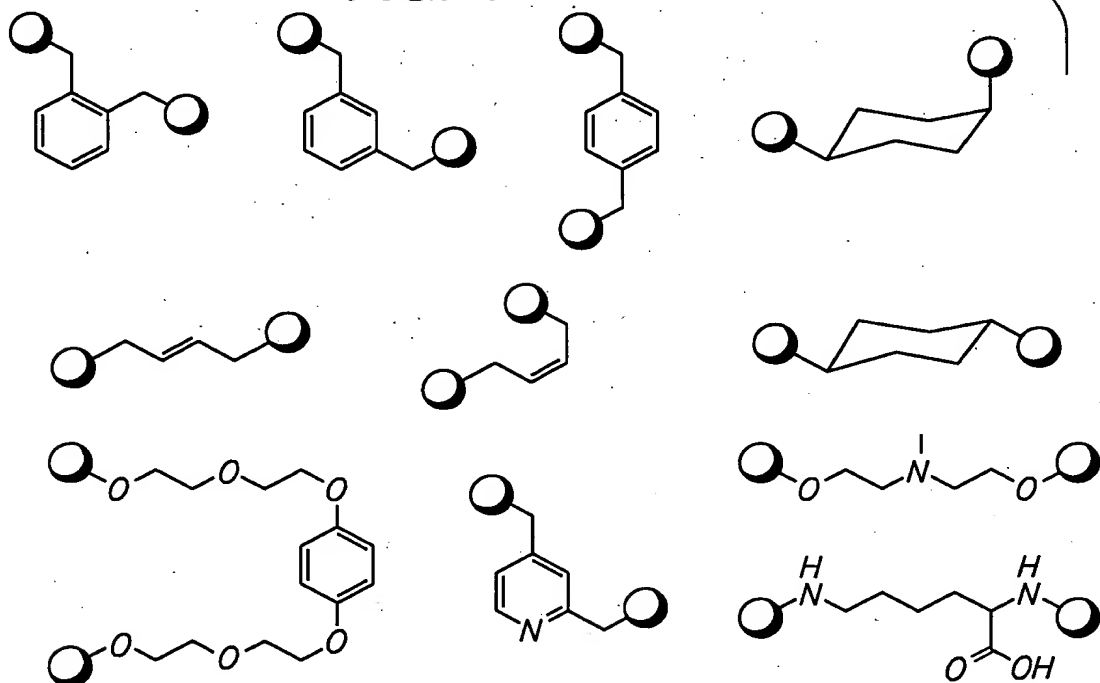
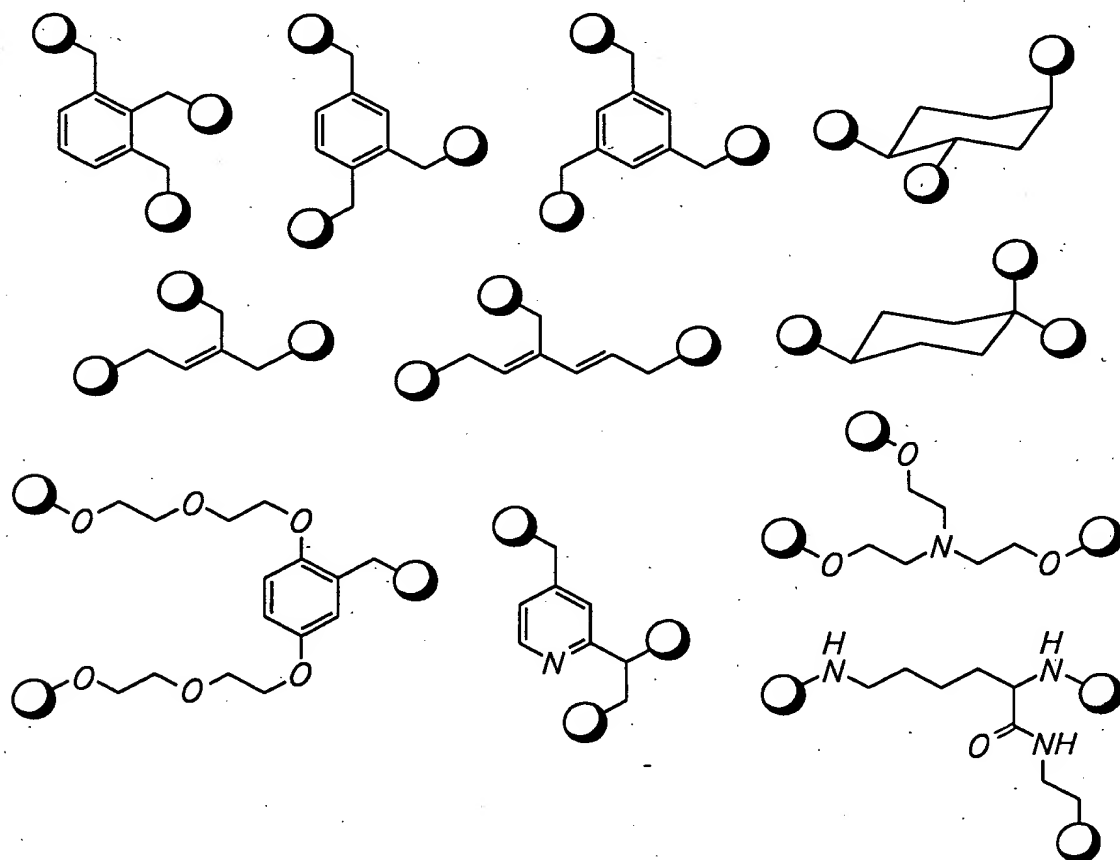


**FIG. 1**



**FIG. 2**



**FIG. 3**

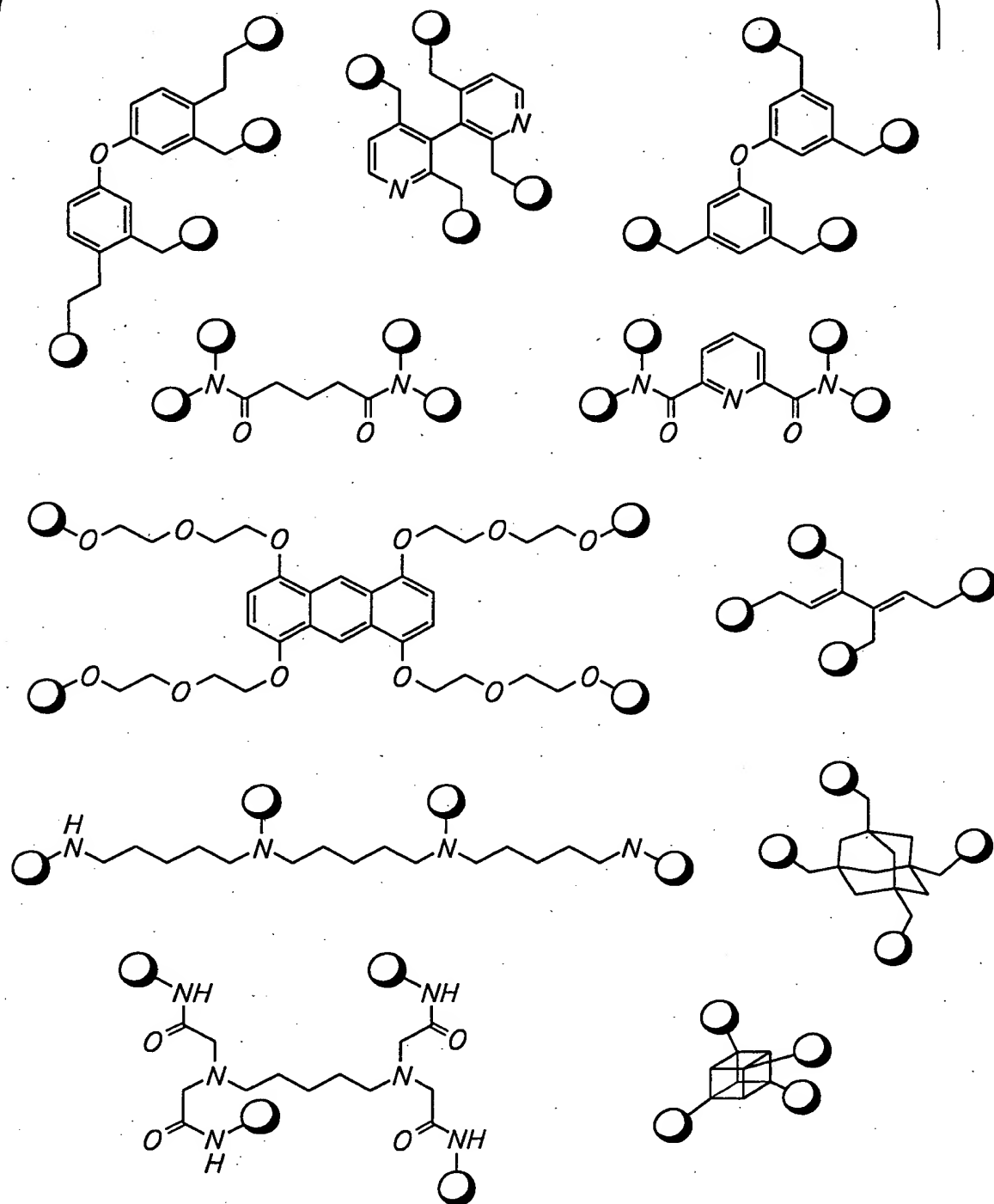
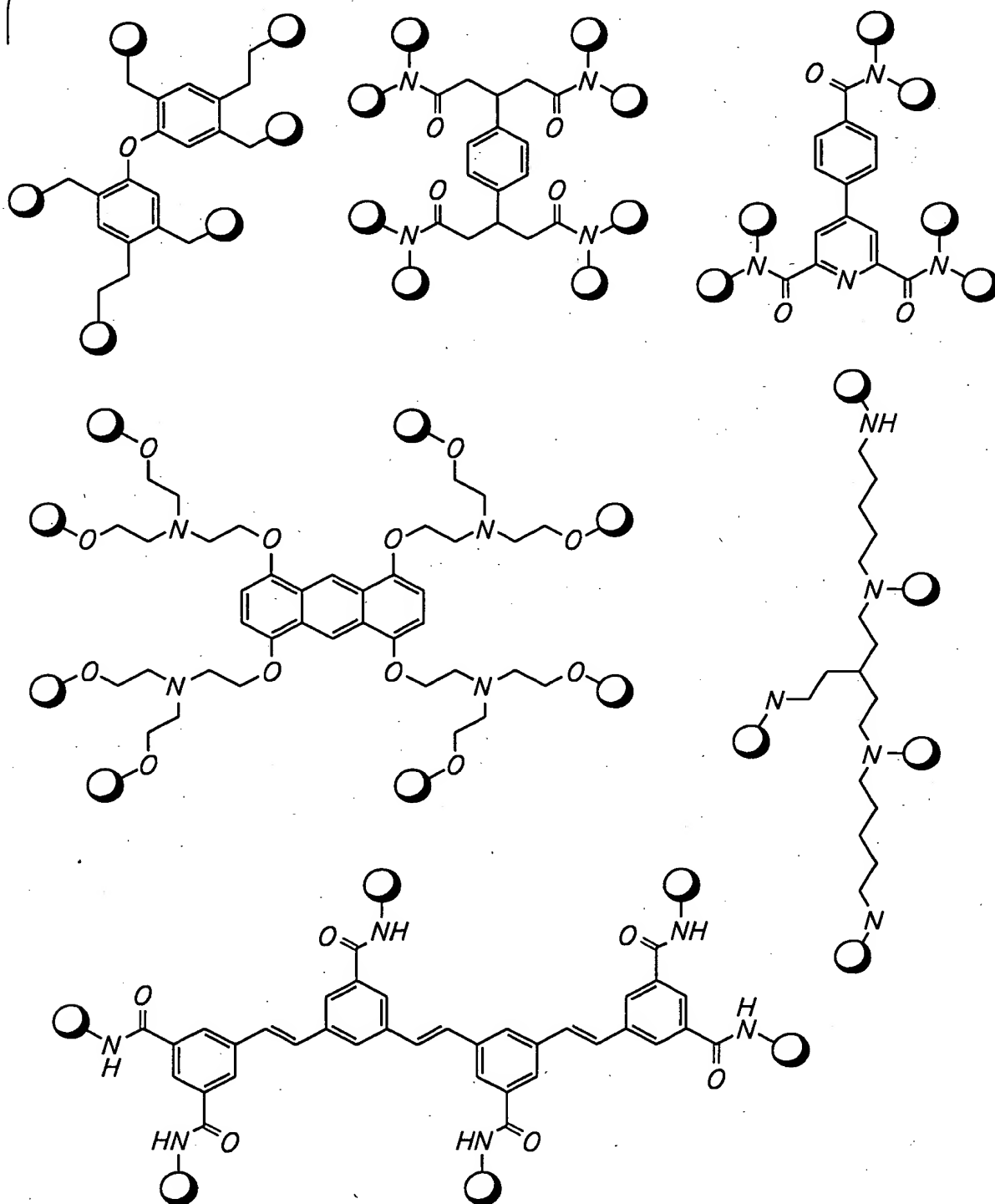
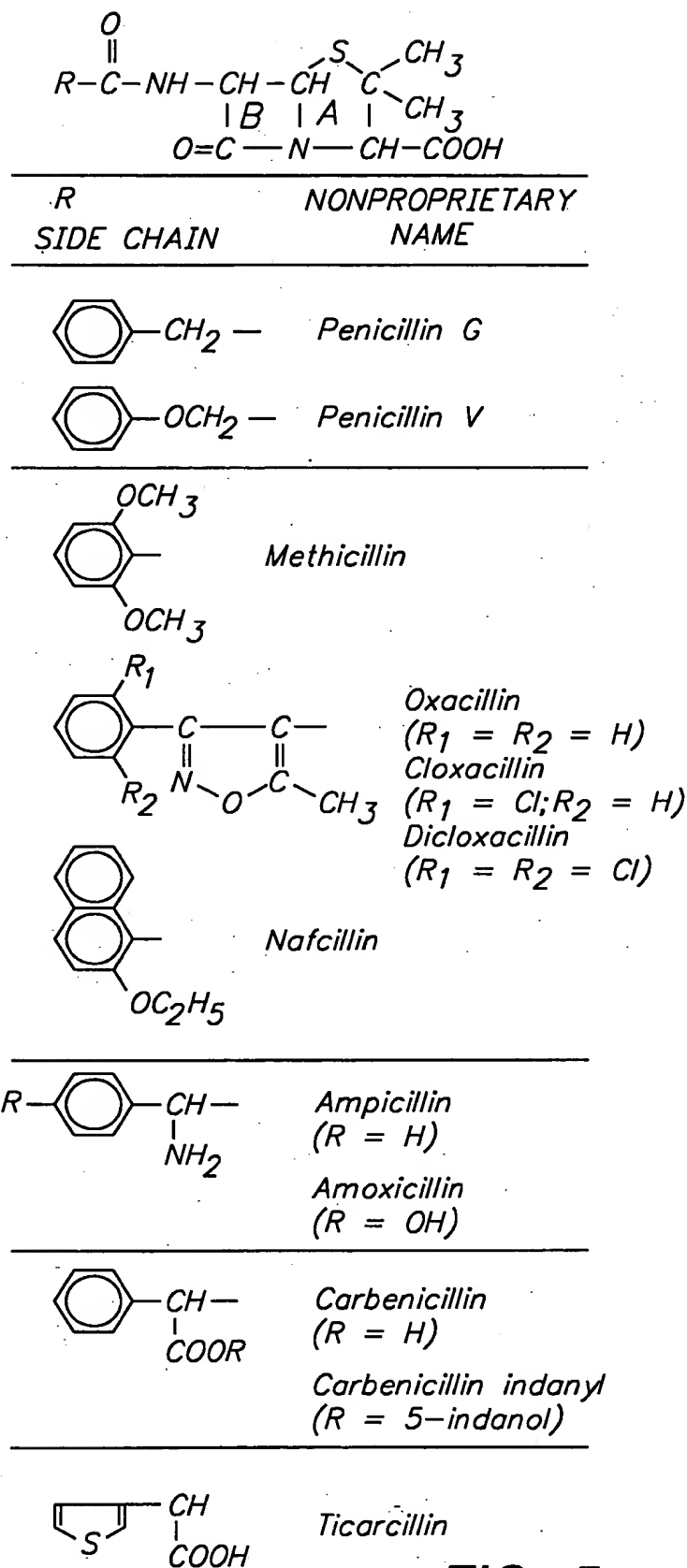


FIG. 4





**FIG. 5**

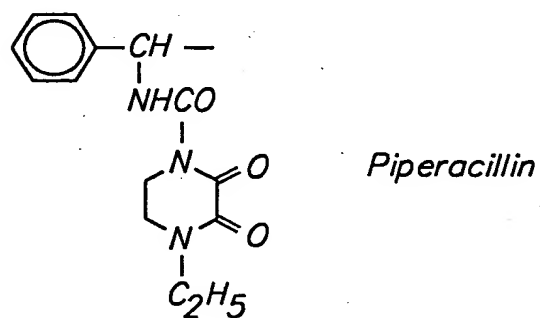
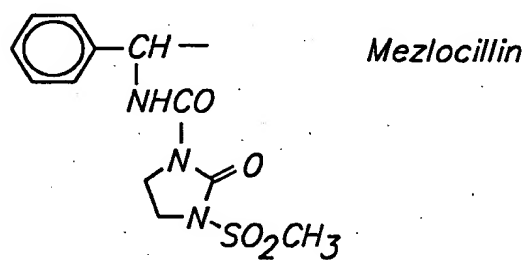
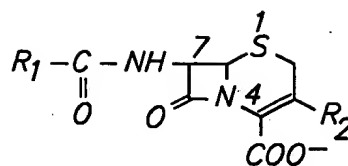


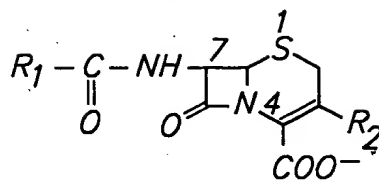
FIGURE 5 CONT'D

**FIG. 6A**



Cephem nucleus

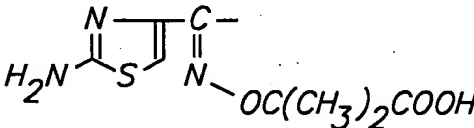
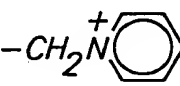
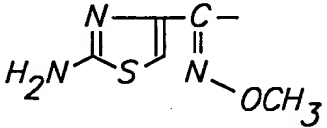
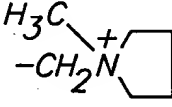
COMPOUND (TRADE NAMES)	R <sub>1</sub>	R <sub>2</sub>
<b>First-Generation</b>		
Cephalothin (KEFLIN)		
Cefazolin (ANCEF, KEFZOL, others)		
Cephalexin (KEFLET, KEFLEX)		
Cefadroxil (DURICEF, ULTRACEF)		
<b>Second-Generation</b>		
Cefamandole (MANDOL)		
Cefoxitin + (MEFOXIN)		
Cefaclor (CECLOR)		
Cefuroxime (KEFUROX, ZINACEF) Cefuroxime axetil $\frac{1}{2}$ (CEFTIN)		
Loracarbef ++ (CEFZIL)		
Cefonicid (MONOCID)		
Cefotetan (CEFOTAN)		



Cephem nucleus

COMPOUND (TRADE NAMES)	R <sub>1</sub>	R <sub>2</sub>
<i>Second-Generation CONTINUED</i>		
Ceforanide (PRECEF)		
<i>Third-Generation</i>		
Cefotaxime (CLAFORAN)		
Cefpodoxime proxetil** (VANTIN)		
Ceftizoxime (CEFTZOX)		
Ceftriaxone (ROCEPHIN)		
Cefoperazone (CEFOBID)		

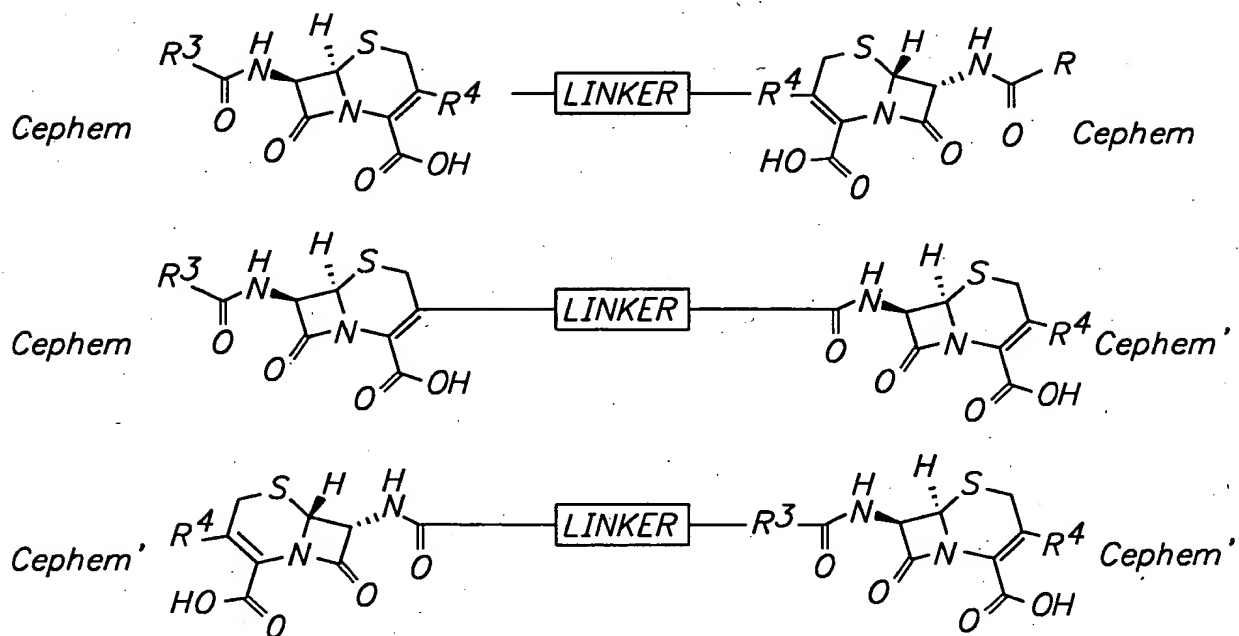
FIG. 6B-1

COMPOUND (TRADE NAMES)	$R_1$	$R_2$
<i>Third-Generation (continued)</i>		
Ceftazidime (FORTAZ, others)		
<i>Fourth-Generation</i>		
Cefepime		

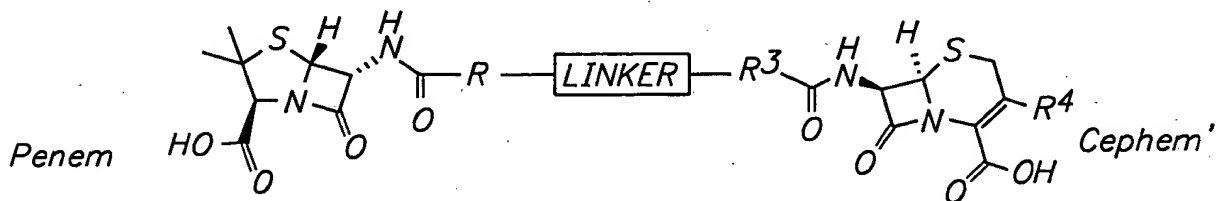
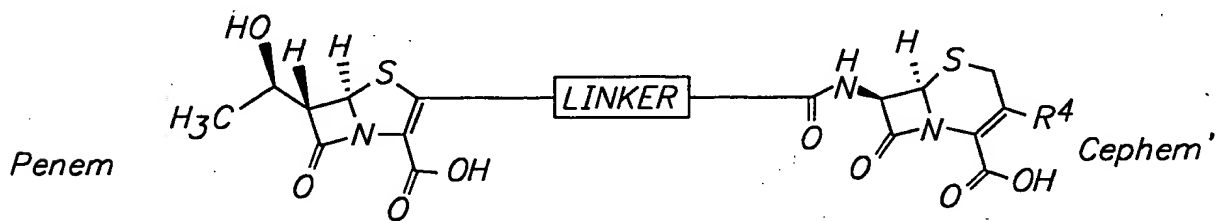
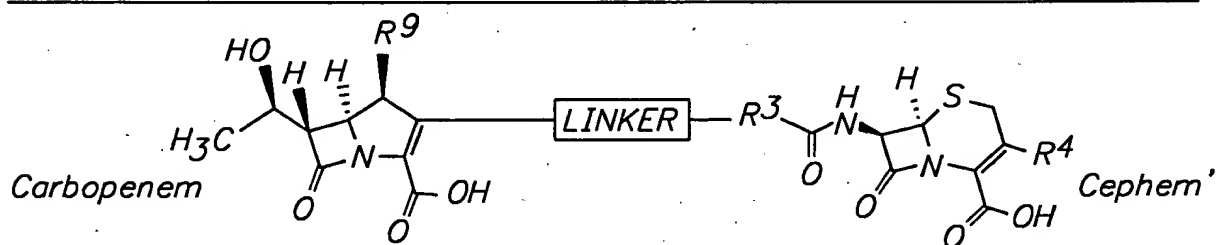
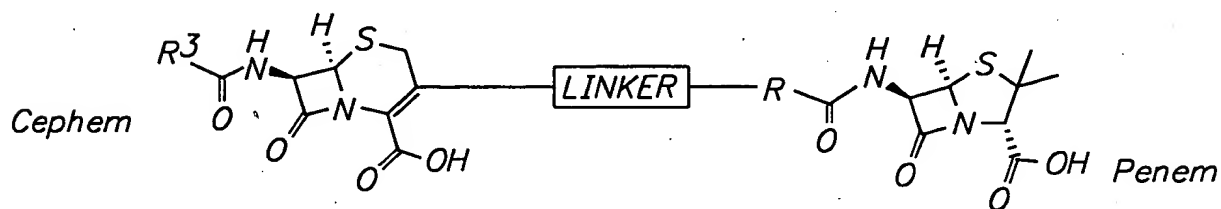
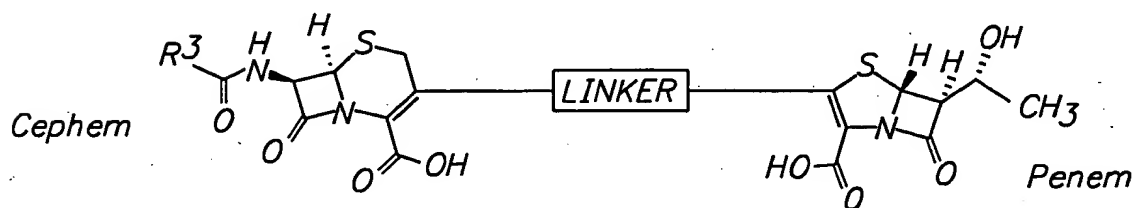
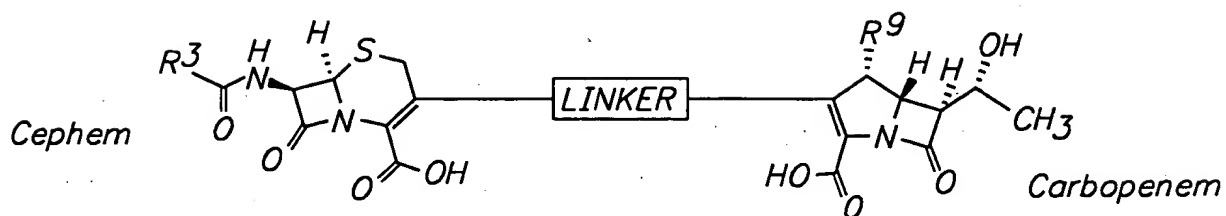
- + Cefoxitin, a cephamycin, has a  $-OCH_3$  group at position 7 of cephem nucleus.
- + Cefuroxime axetil is the acetyloxyethyl ester of cefuroxime.
- ++ Loracarbef, a carbacephem, has a carbon instead of sulfur at position 1 of cephem nucleus.
- \*\* Cefpodoxime proxetil has a  $-COOCH(CH_3)OCOCH(CH_3)_2$  group at position 4 of cephem nucleus.

**FIG.6B-2**





**FIG. 7A**



**FIG. 7B**

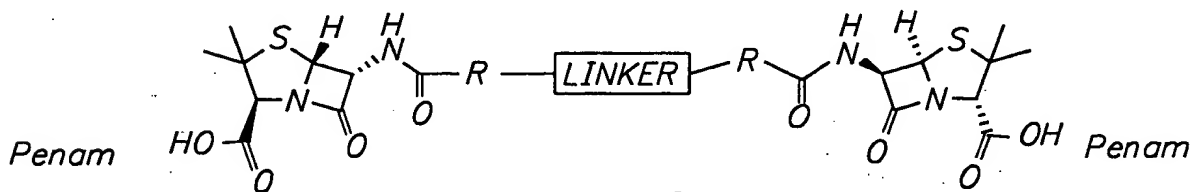
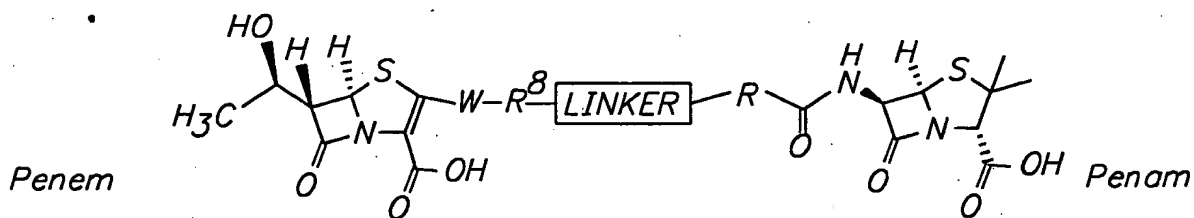
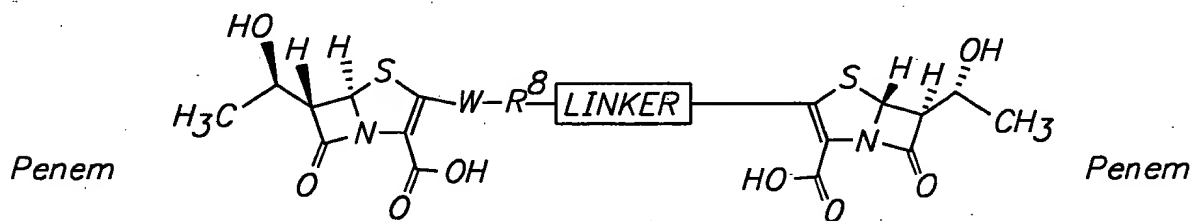
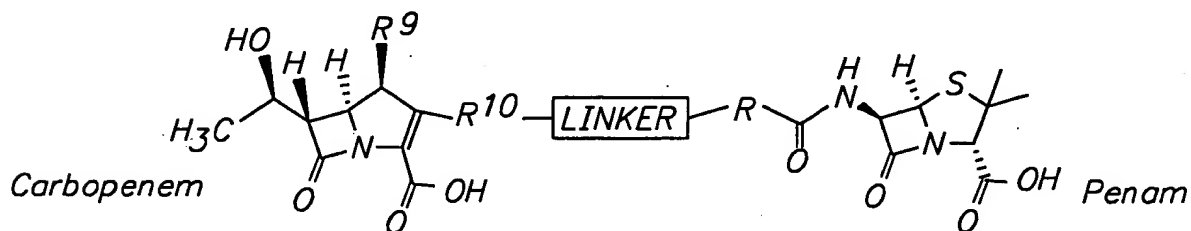
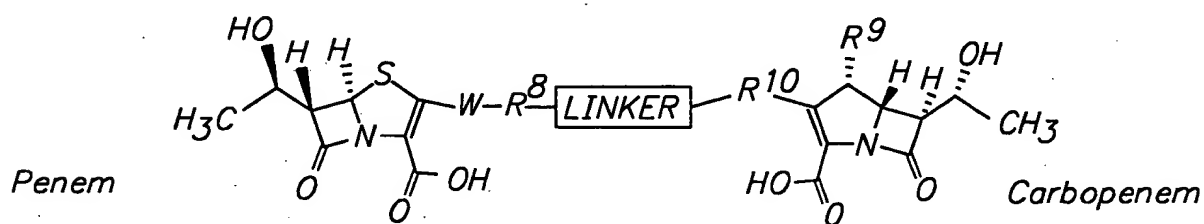
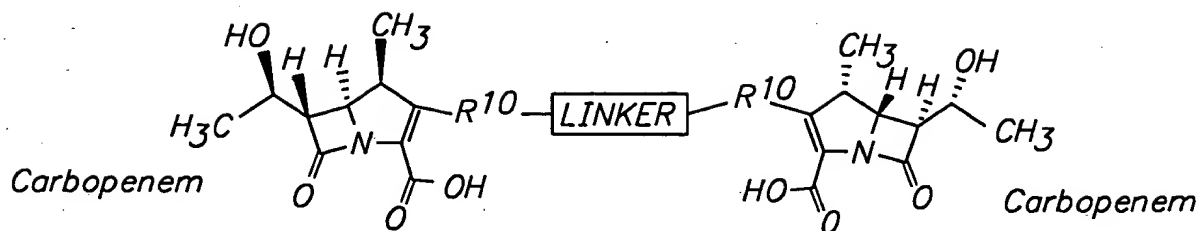


FIG. 8A

*Likewise:*

*Oxacephem-Cephem*  
*Oxacephem-Cepham'*  
*Oxacephem-Penam*  
*Oxacephem-Penem*  
*Oxacephem-Carbopenem*  
*Oxacephem-Carbocephem*  
*Oxacephem-Trinem*  
*Oxacephem-Monobactam*  
*Oxacephem-Monobactam'*

*Likewise:*

*Carbacephem-Cephem*  
*Carbacephem-Cepham'*  
*Carbacephem-Penam*  
*Carbacephem-Penem*  
*Carbacephem-Carbopenem*  
*Carbacephem-Carbocephem*  
*Carbacephem-Trinem*  
*Carbacephem-Monobactam*  
*Carbacephem-Monobactam'*

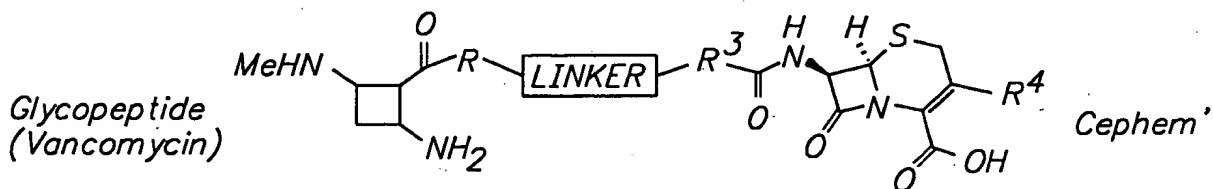
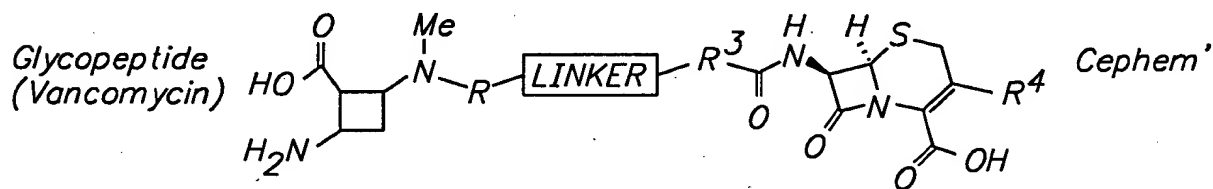
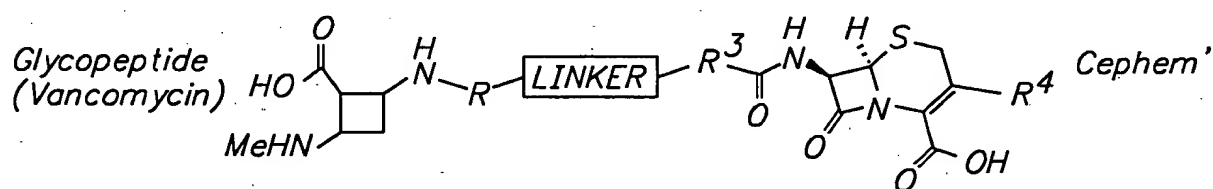
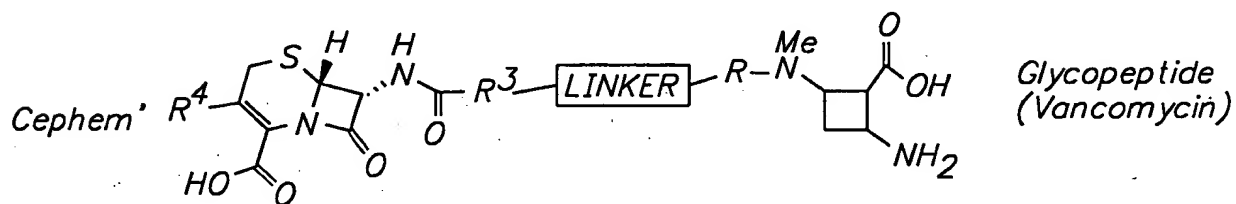
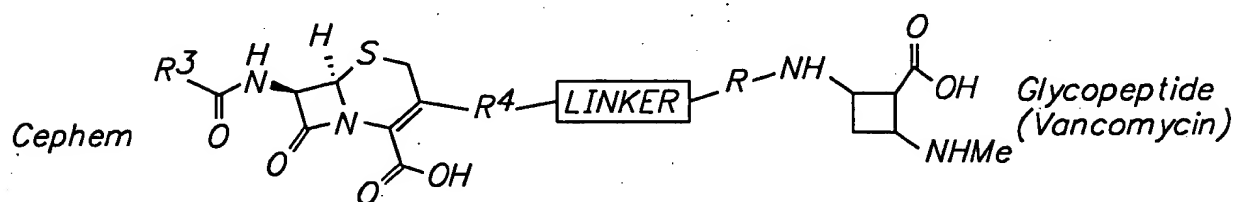
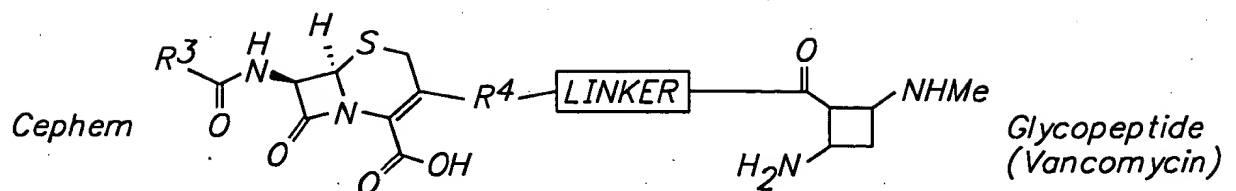
*Likewise:*

*Trinem-Cephem*  
*Trinem-Cepham'*  
*Trinem-Penam*  
*Trinem-Penem*  
*Trinem-Carbopenem*  
*Trinem-Carbocephem*  
*Trinem-Trinem*  
*Trinem-Monobactam*  
*Trinem-Monobactam'*

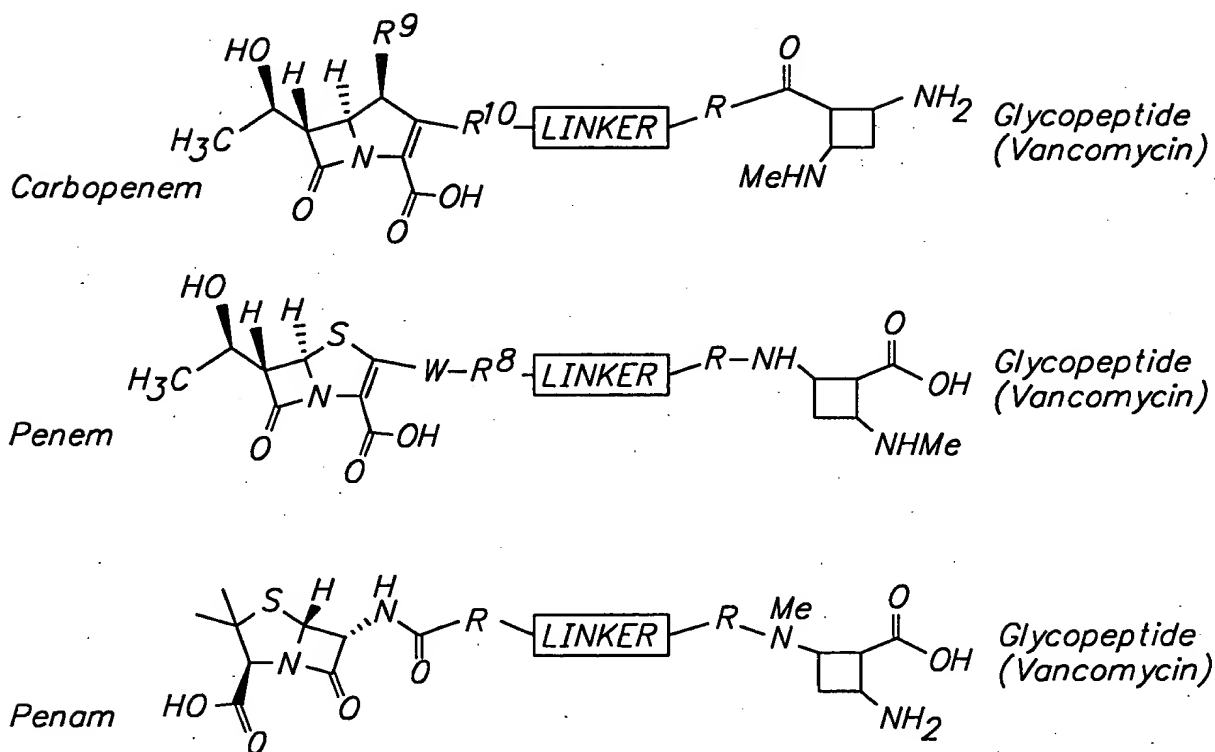
*Likewise:*

*Monobactam-Cephem*  
*Monobactam-Cepham'*  
*Monobactam-Penam*  
*Monobactam-Penem*  
*Monobactam-Carbopenem*  
*Monobactam-Monobactam*  
*Monobactam-Monobactam'*  
*Monobactam'-Monobactam'*

**FIG. 8B**



**FIG. 9**



Likewise Glycopeptide Antibiotic Linked to these  
betalactam Antibiotics:

Oxacephem— Glycopeptide Antibiotic  
 Trinem— Glycopeptide Antibiotic  
 Carbacephem—Glycopeptide Antibiotic  
 Monobactam— Glycopeptide Antibiotic  
 Monobactam'— Glycopeptide Antibiotic

**FIG. 10**

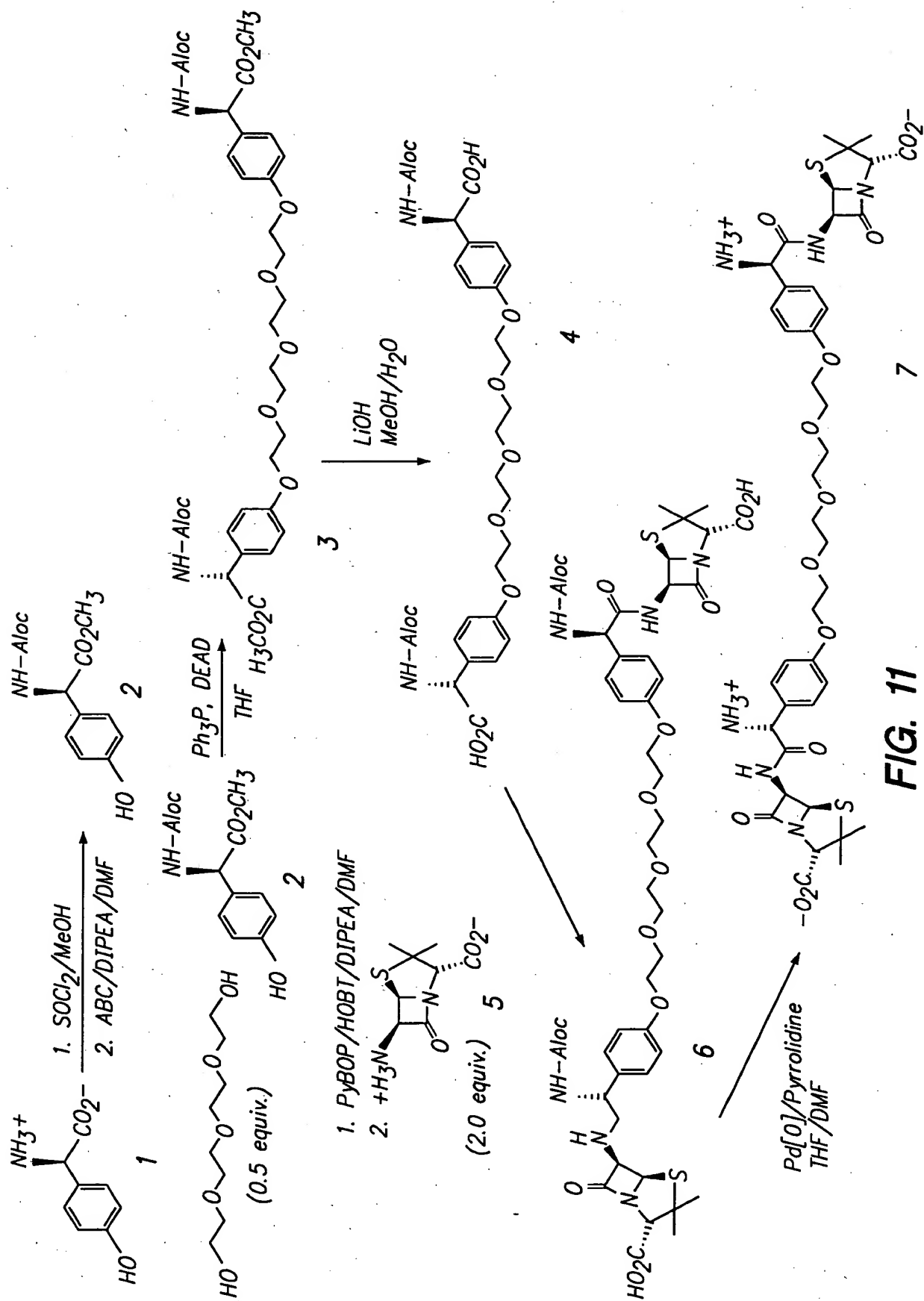


FIG. 11

Chemical reaction scheme showing the synthesis of compound 13 from compound 11 and compound 12.

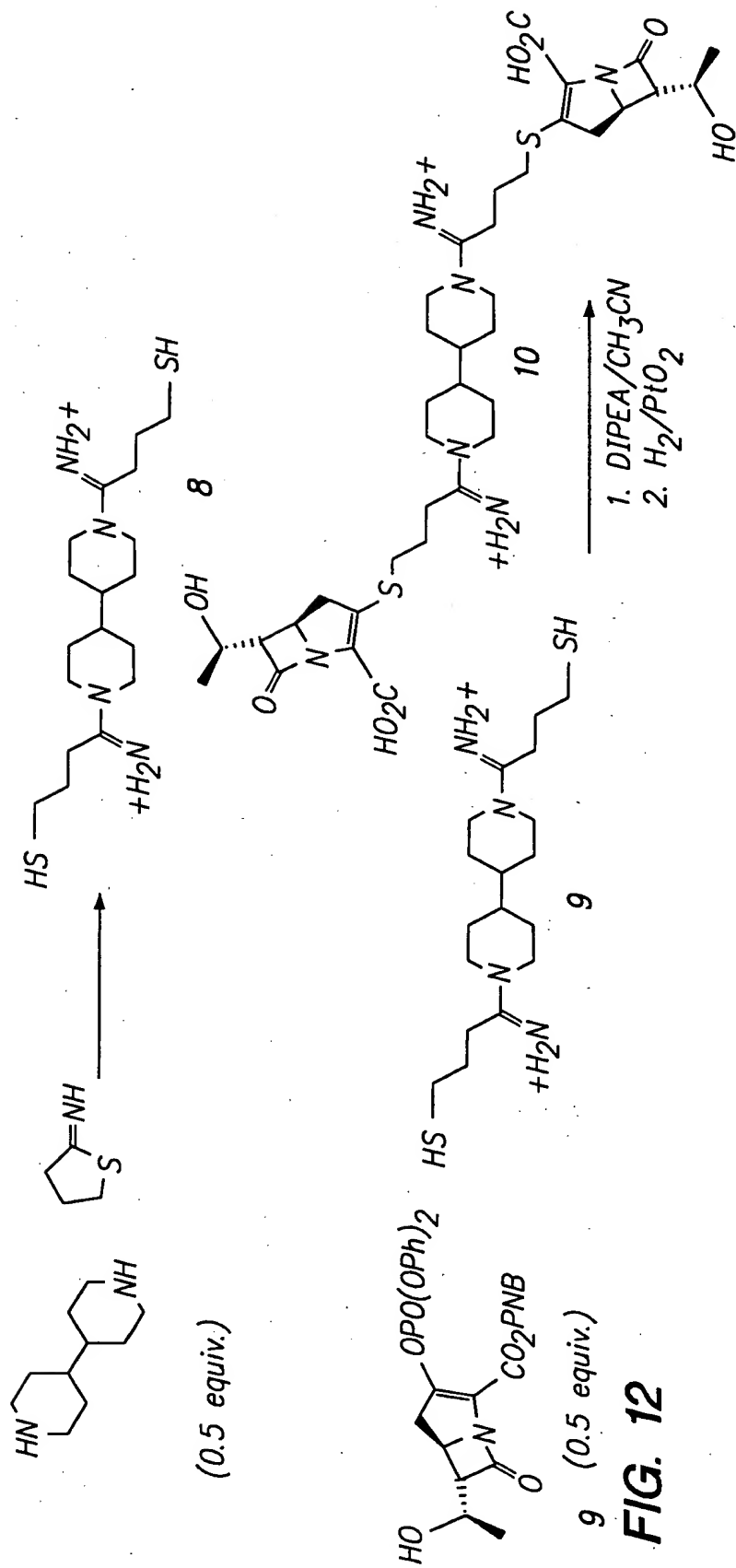


FIG. 12

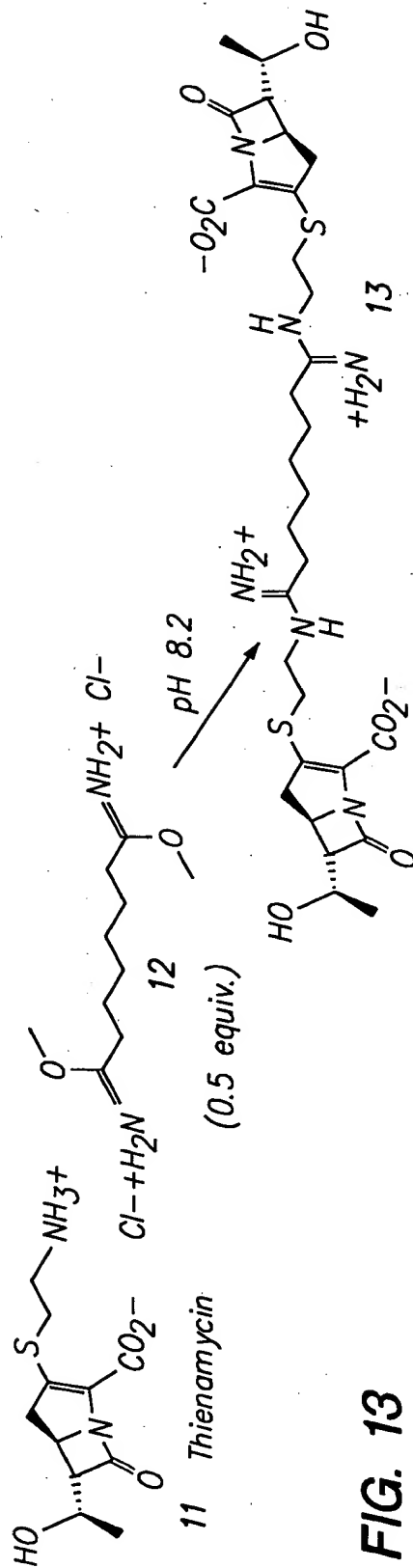
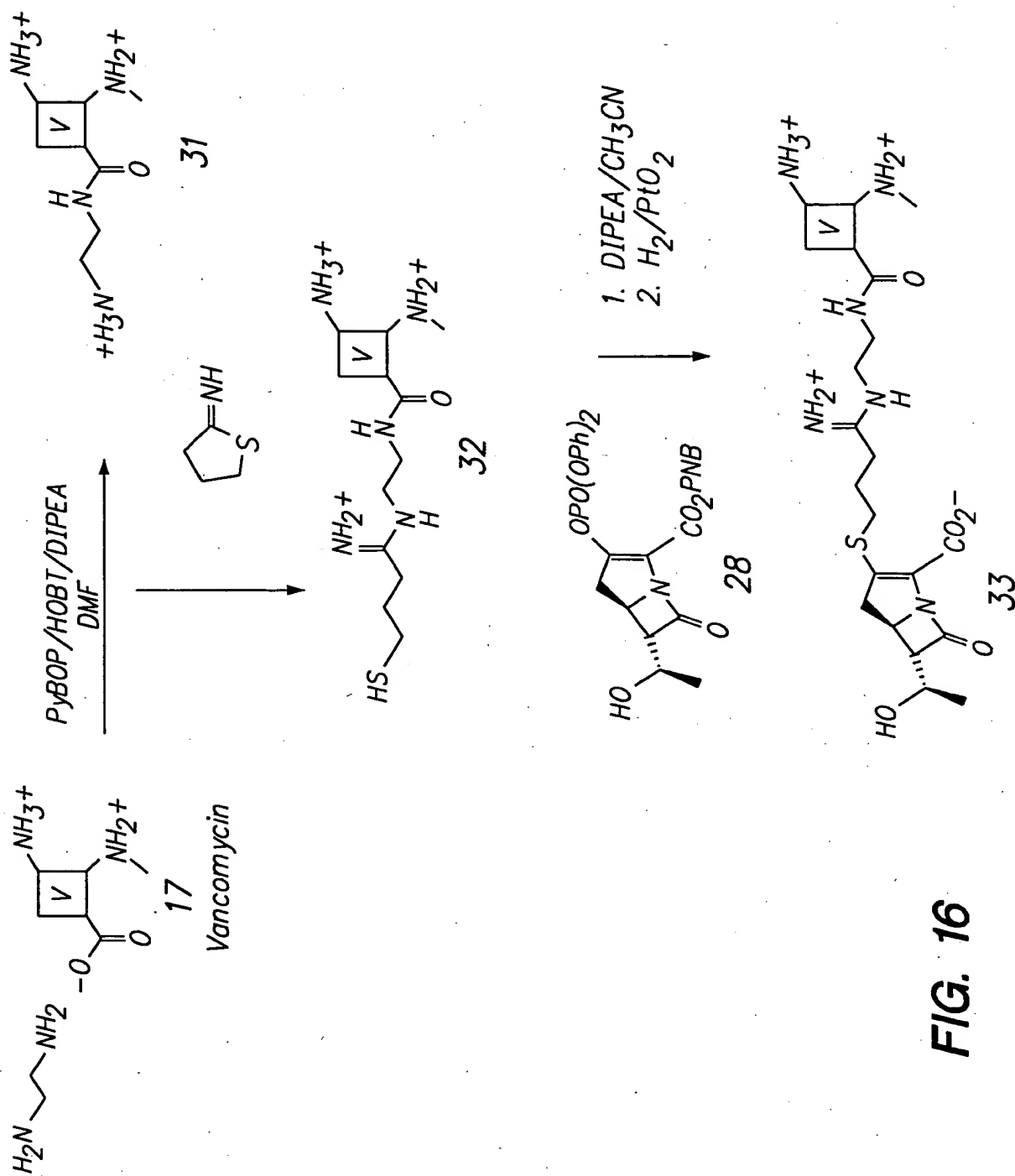


FIG. 13

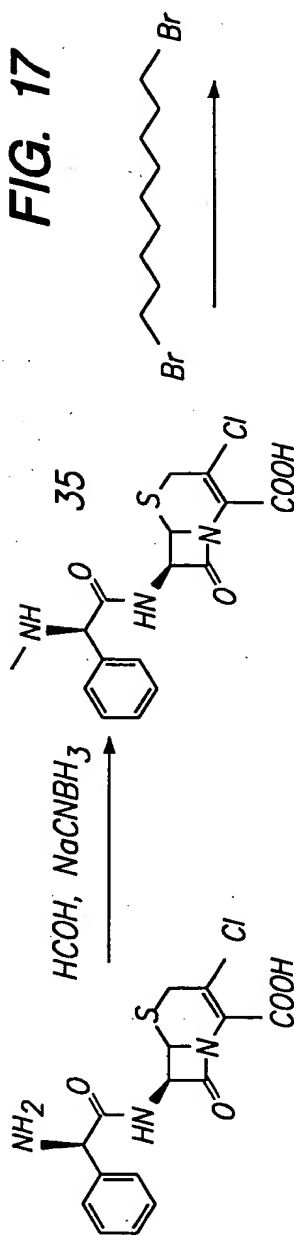








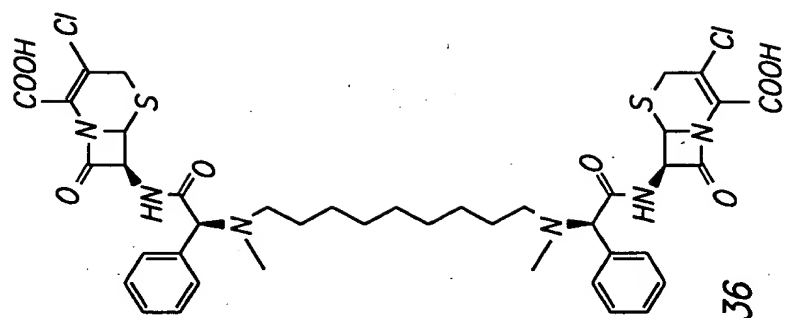
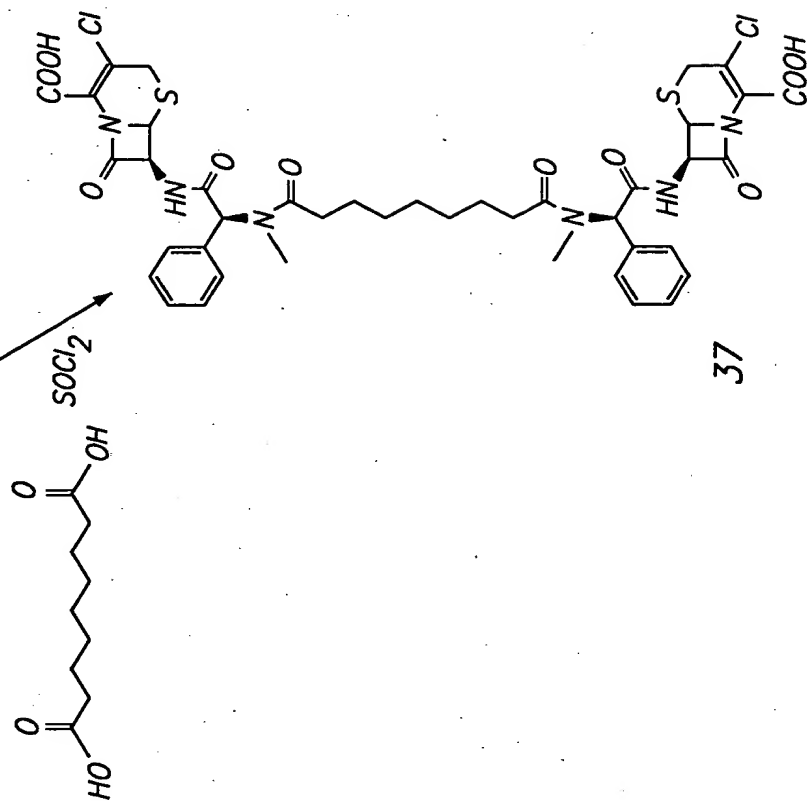
**FIG. 16**

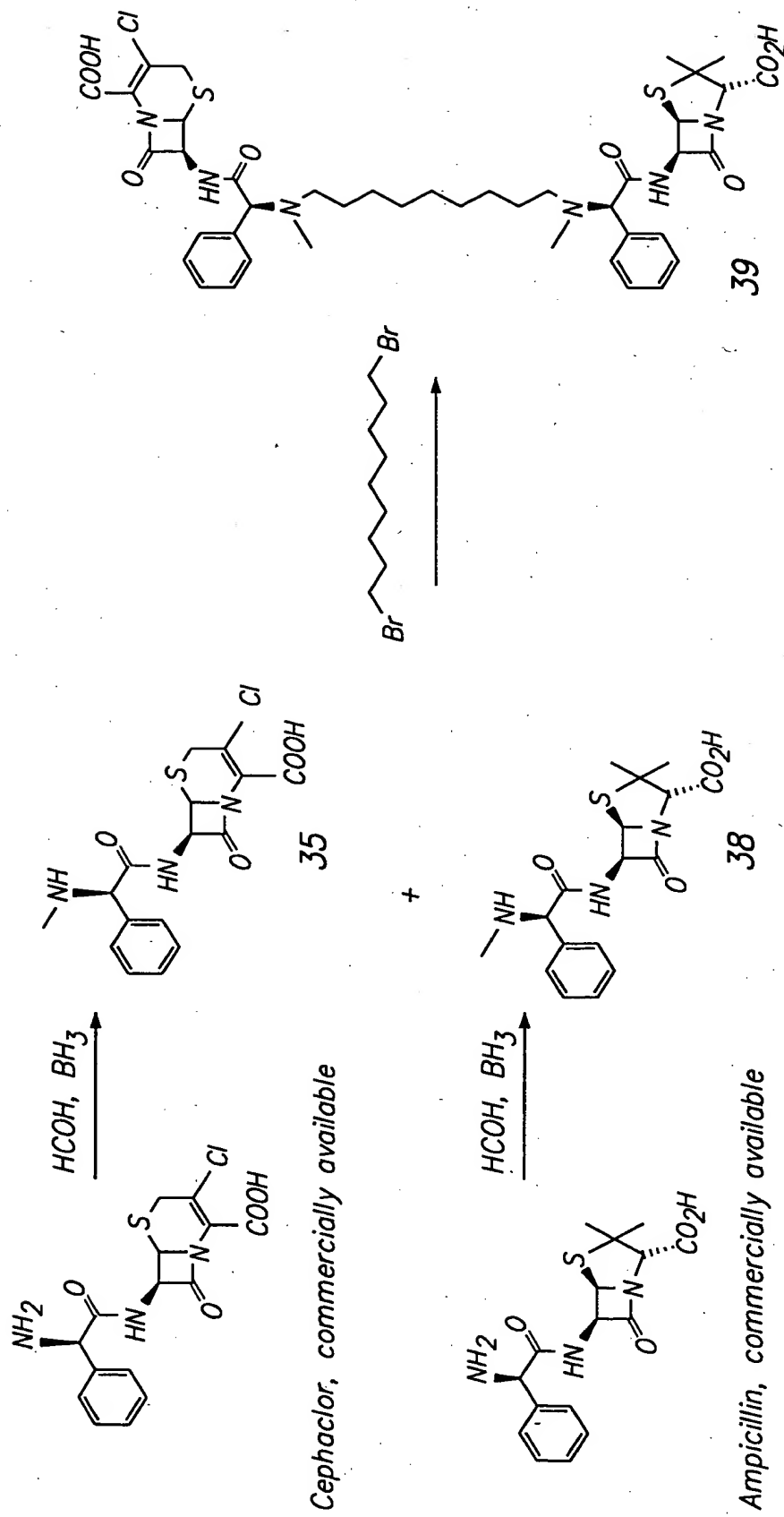


Cephaclo, commercially available

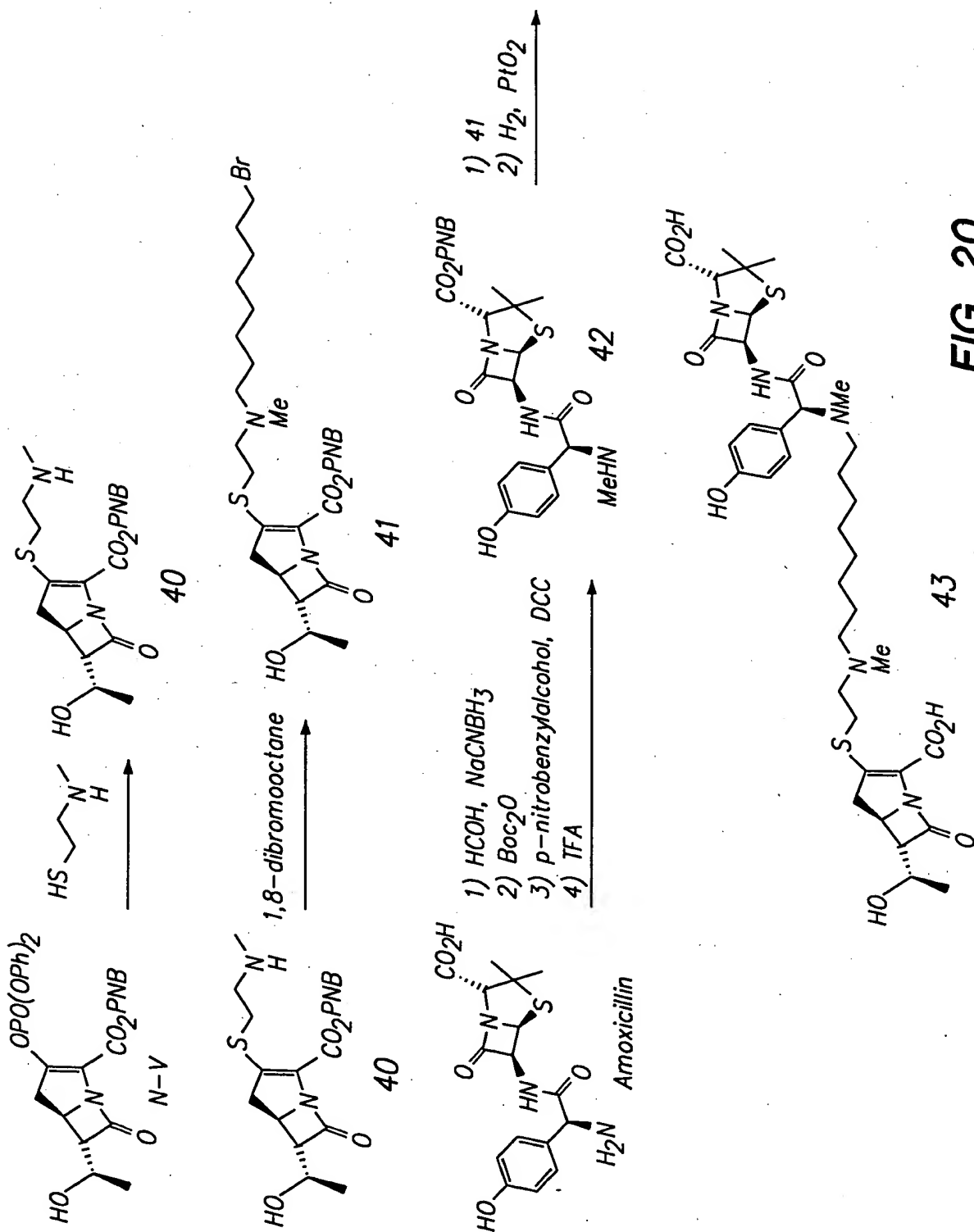
34

**FIG. 18**





**FIG. 19**



**FIG. 20**

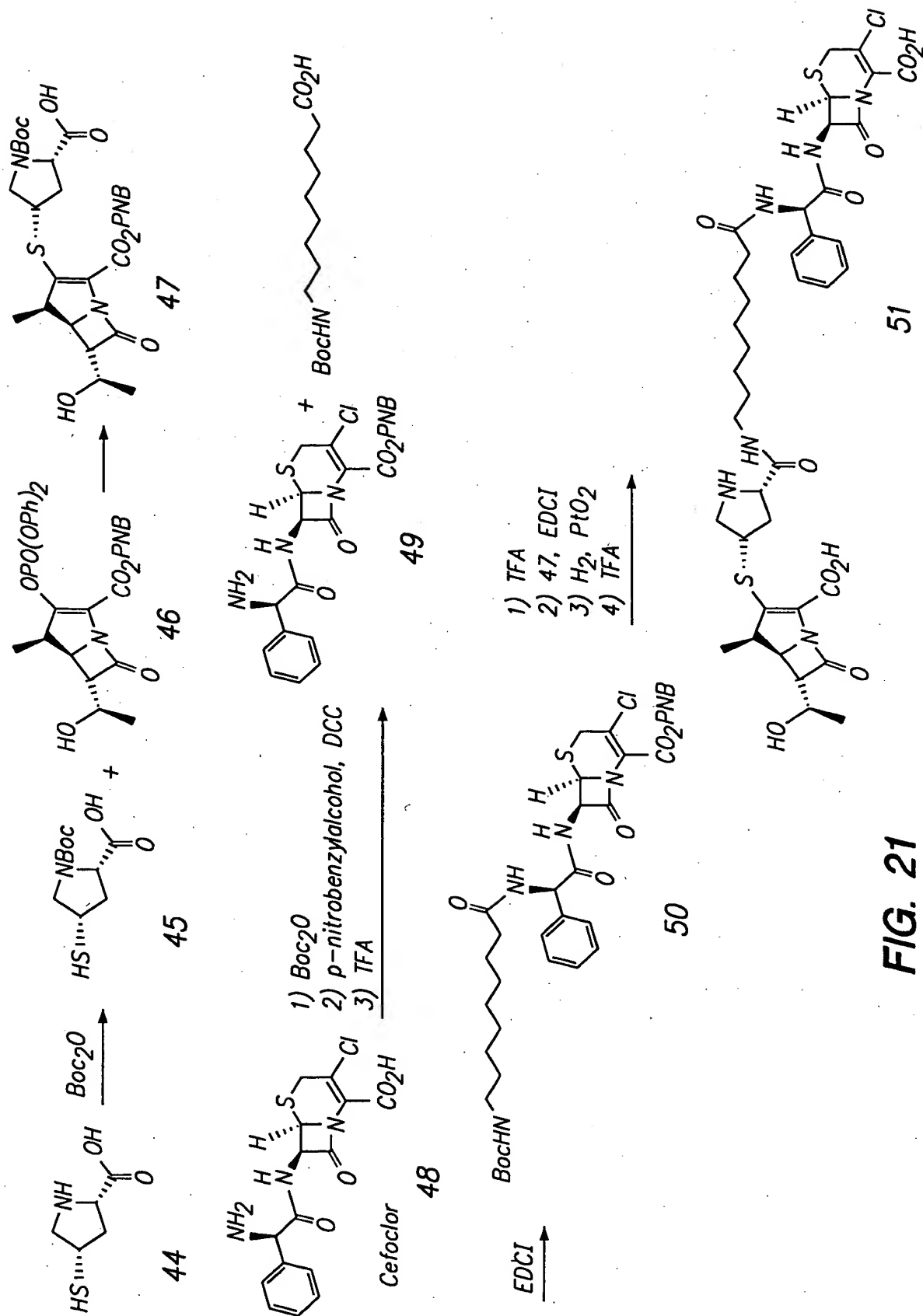


FIG. 21

FIGURE 22

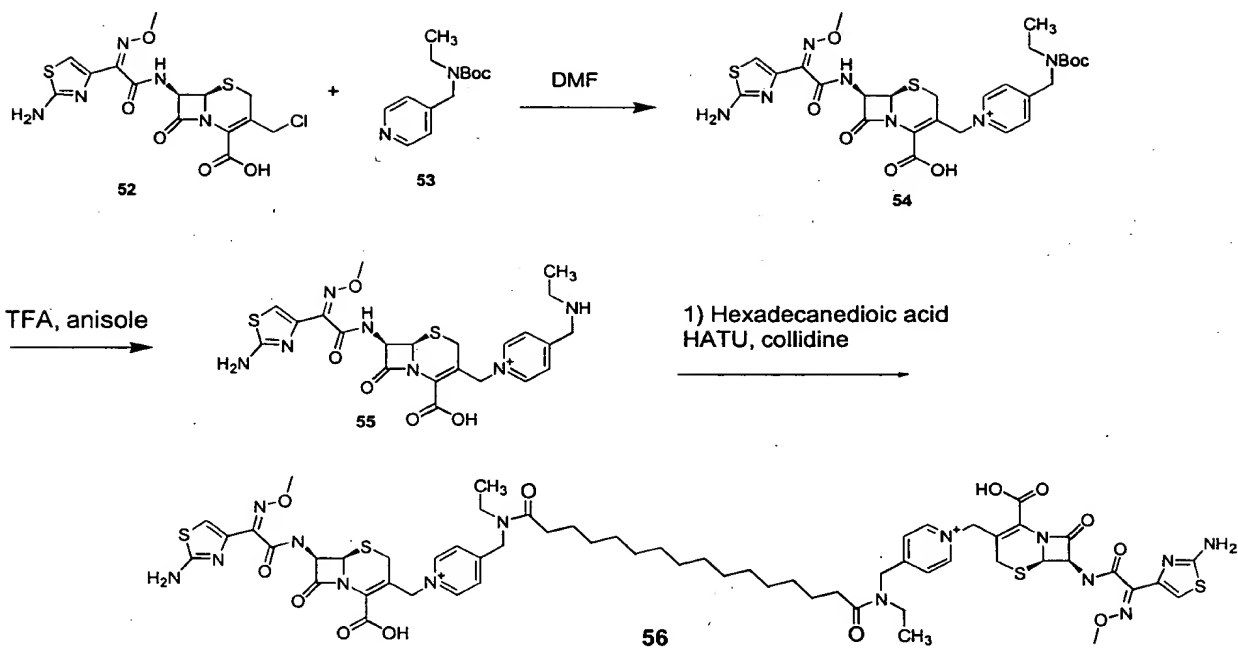




Figure 23

